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Instructions in English, French, and Spanish
Instructions en Anglais, Français et Espagnol
Instrucciones en Inglés, Francés y Español

FUEL PRESSURE KIT USER'S GUIDE

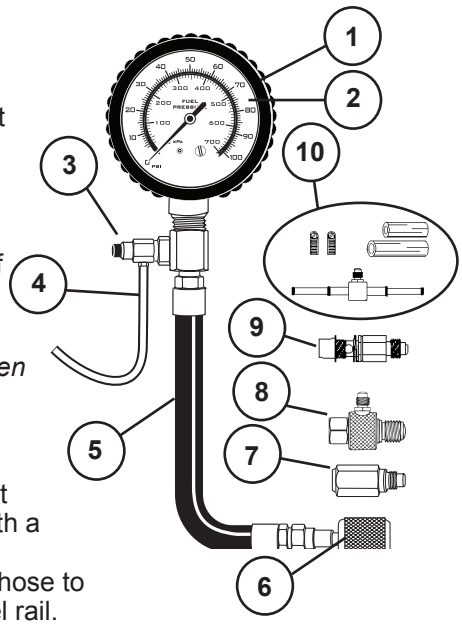
The Fuel Pressure Kit was designed to help diagnose driveability problems due to abnormally high or low fuel pressure.

Safety Precautions

To prevent accidents that could result in serious injury and/or damage to vehicle or test equipment, carefully follow safety rules and test procedures at all times when working on vehicles.

- Always wear approved eye protection.
- Never use Fuel Pressure Kit on **Diesel** or **Flex Fuel** engines!
- Never attach or remove Fuel Pressure Kit from fuel rail test port with ignition key on.
- Always place end of 6 foot bleed-off hose in an approved container for fuel during testing and when bleeding off fuel pressure.
- Never smoke or have open flames near vehicle. Vapors from fuel and charging battery are highly flammable and explosive.
- Never permit fuel to spill on hot engine parts. If a spill or leak occurs, immediately turn ignition key off, and clean up fuel.
- Only use Fuel Pressure Tester Kit for measuring fuel pressure.
- Always operate vehicle in a well ventilated area. Do not inhale exhaust gases or fuel vapors.
- Always keep yourself, tools and test equipment away from all moving or hot engine parts.
- Always make sure vehicle is in **PARK** (Automatic transmission) or **NEUTRAL** (manual transmission) and **parking brake is set**. Block drive wheels.
- Never lay tools on vehicle battery. Terminals may short together causing harm to yourself, tools or battery.
- Never leave vehicle unattended while running tests.
- Always keep a fire extinguisher suitable for fuel/electrical/chemical fires handy.
- Always use extreme caution when working around ignition coil, distributor cap, ignition wires, and spark plugs. These components contain **High Voltage** when engine is running.
- Complete **all Pre-Testing Checks** before beginning fuel pressure testing.
- Always follow vehicle manufacturer's warnings, cautions and service procedures.

Fuel Pressure Tester Description



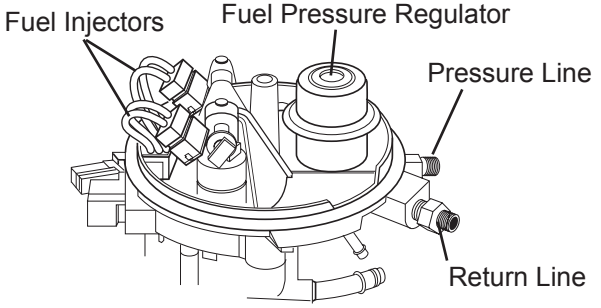
1 **Rubber Boot:** Boot is used to protect gauge and maintain appearance.
2 **Dial Face:** Contains measurement scales that show amount of fuel pressure present in fuel system.
3 **Pressure Relief Button:** Used to relieve fuel pressure in gauge hose before disconnecting gauge hose from fuel rail.
4 **Bleed-Off Hose:** A 6 foot hose that bleeds off fuel pressure when pressure relief button is pressed. Never use a bleed-off hose shorter than 6 foot.

Important: Always make sure end of bleed-off hose is in an approved container for fuel at all times during testing and when bleeding off fuel pressure!!

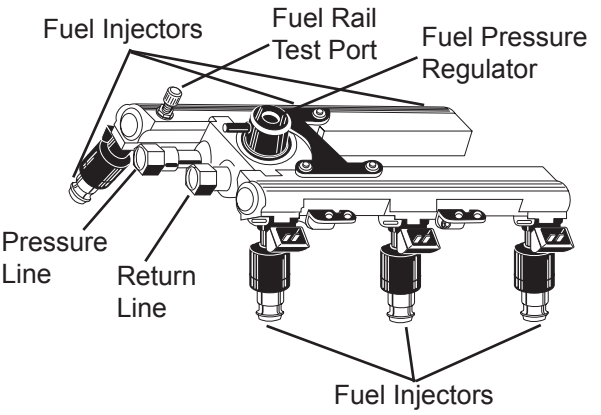
5 **Gauge Hose:** Hose that carries fuel to the gauge, so that pressure can be measured.
6 **GM/Chrysler Test Port Adapter:** Adapter is used to connect gauge hose to GM, Chrysler, and other vehicles equipped with a schrader valve test port on fuel rail.
7 **Ford Test Port Adapter:** Adapter is used to connect gauge hose to Ford vehicles equipped with a schrader valve test port on fuel rail.
8 **GM TBI Test Adapter:** Adapter is used to connect gauge hose to GM TBI vehicles NOT equipped with a schrader valve test port.
9 **Banjo Bolt Adapters:** Adapter are used to connect gauge hose to Asian, European and select domestic vehicles equipped with fuel Banjo Bolt Connections.
10 **Dual Manifold Test Adapter:** Adapter is used to connect gauge hose to vehicles with rubber hose connections on the fuel rail, fuel line, or fuel filter.

Fuel Injection System Theory

There are two basic types of fuel injection systems currently being used. The first type is called "port" or "multi-port" fuel injection. In this system, fuel injectors spray fuel directly into intake manifold behind intake valve. These systems typically have one fuel injector per cylinder. The second type is commonly called Throttle Body Injection (TBI) for GM and Chrysler vehicles or Central Fuel Injection (CFI) for Ford vehicles. These systems use one or two fuel injectors mounted on top of intake manifold. They spray fuel into throttle body similarly to a conventional carburetor.



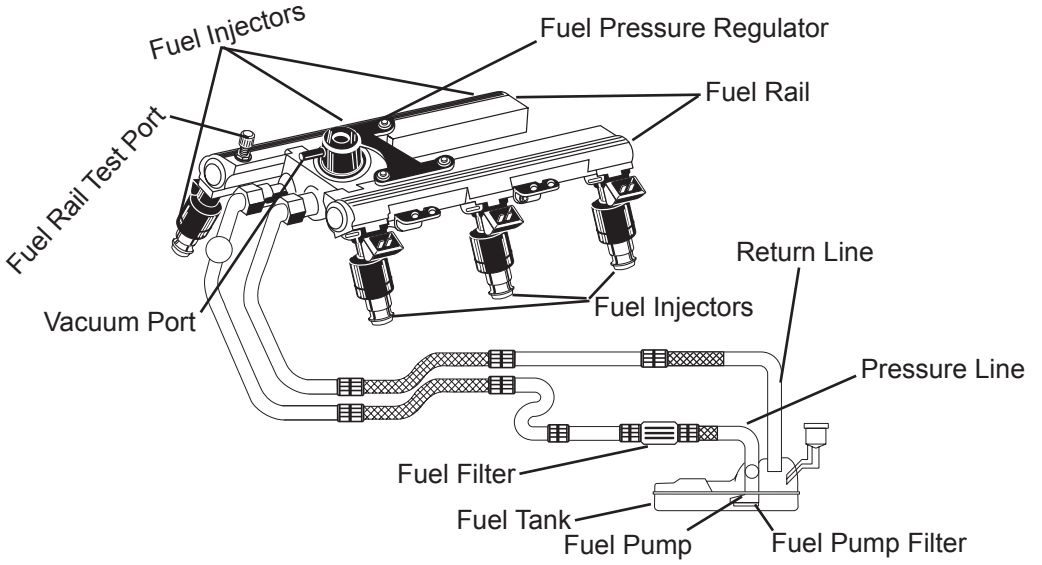
Ford CFI Throttle Body



GM Multi-Port Fuel Injection

Fuel System Components

Before doing any fuel pressure testing, it is a good idea to understand how fuel system components work and how they relate to one another. The fuel pump pumps fuel from the fuel tank to the fuel pressure regulator and fuel injectors. Fuel pressure regulator divides fuel between the pressure line and return line. The fuel in the pressure line goes to fuel injectors, while fuel is returned to fuel tank through the return line.



Fuel Tank: A large container that holds vehicle's supply of fuel.

Fuel Pump Filter: A filter that is usually located in fuel tank. Its function is to prevent foreign particles from reaching the fuel pump. A clogged or restricted fuel pump filter can cause low fuel pressure readings. When replacing a fuel pump it is a good idea to replace the fuel pump filter.

Fuel Pump: An electric motor that pumps fuel into the fuel system at a constant pressure. It is mounted in the fuel tank or on the frame. Some vehicles have more than one fuel pump.

Return Line: Path way for excess fuel to return to the fuel tank.

Pressure Line: A pressurized fuel line that carries fuel from the fuel tank to the fuel injectors.

Fuel Filter: A filter that is located in-line with the pressure line. Its function is to prevent foreign particles from reaching the fuel injectors. A clogged or restricted fuel filter can also cause low fuel pressure readings. This is the only fuel system component that requires periodic replacement. Refer to vehicle owners manual for replacement interval.

Fuel Rail Test Port: A schrader valve located on the fuel rail that allows easy connection of a fuel pressure gauge to measure fuel pressure. Do not confuse this valve with the schrader valves that are used for recharging air conditioning systems.

Fuel Pressure Regulator: The fuel pressure regulator is connected across the pressure line and return line. It contains a spring loaded valve assembly that opens to allow fuel to move into the return line, when the pressure line fuel pressure is exceeded. It is used to keep a constant fuel pressure drop across the fuel injectors. Some fuel pressure regulators have a vacuum port so fuel pressure can be adjusted based on engine load. These are commonly called vacuum actuated (compensated) fuel pressure regulators. A leaking fuel pressure regulator can cause low fuel pressure readings and hard starting problems.

Fuel Rail: The fuel rail assembly is bolted to the intake manifold. Its purpose is to hold the fuel injectors in place and to deliver pressurized fuel to the fuel injectors.

Fuel Injectors: A precision valve that is controlled by a solenoid. Fuel injection is controlled by the amount of fuel pressure, and the size and duration of the valve opening. Fuel injectors contain a filter used to prevent very small particles from clogging the valve. Leaking fuel injectors will cause fuel pressure to slowly decrease when the ignition key is on and engine is off.

Pre-Testing Checks

1. Read Safety Precautions.
2. Do a thorough visual and “hands-on” inspection of the engine and fuel system. Look for loose or cracked electrical wiring, battery cables, ignition wires, and fuel or vacuum lines.
3. Verify that the battery is fully charged and fuel tank has an adequate supply of fuel.
4. Verify that the inertia switch on certain Ford/ Lincoln/Mercury vehicles has not been tripped. (The inertia switch is usually located in the trunk.)
5. Verify that all fuel system fuses are good.
6. Verify fuel vapor recovery system and gas cap are in good condition.
7. Verify that manifold vacuum is within manufacturers specification which is typically 18-20 inches at idle.
8. Look for fuel leaks and wipe up any spilled fuel immediately.
9. If engine will not start, check ignition system for spark. If no ignition spark is present, refer to vehicle service manual for No Start Diagnostics.
10. Inspect wire harnesses and electrical connectors for damaged or corroded parts.
11. Check other electrical systems including ignition and car computer system.

Fuel Pressure Testing Procedures

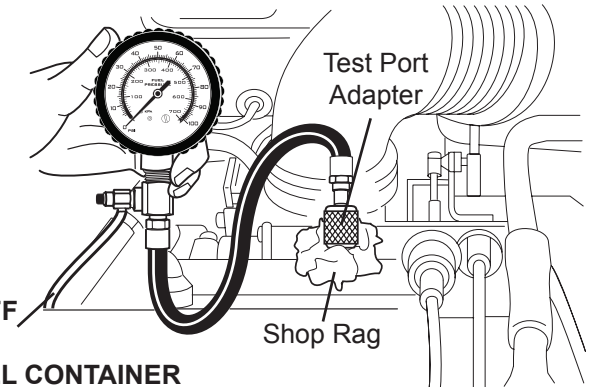
This test procedure explains how to make fuel pressure measurements on vehicles while ignition key is on and while engine is at idle. The procedure also explains the safest way to connect and disconnect fuel pressure tester kit from vehicles. If fuel pressure readings measured in this test procedure are not within vehicles manufacturer’s specification, then use vehicle service manual along with fuel pressure tester kit to service problem. This test procedure does not contain any vehicle specific diagnostics.

1. Read all SAFETY PRECAUTIONS and PRE-TESTING CHECKS.
2. Apply a lightweight household oil to rubber “O” rings on test adapters.
3. Turn Ignition Key OFF.
4. Install Gauge.

For GM/Chrysler vehicles with test port...

- Remove Test Cap.
- Screw GM/Chrysler test port adapter to fuel rail test port until finger tight.

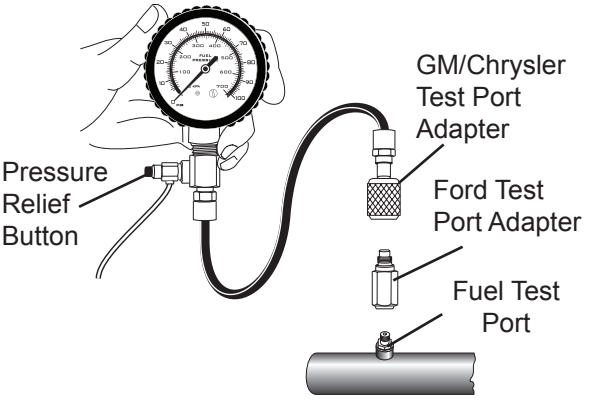
Note: Always wrap a shop rag around fuel rail test port when attaching test port adapters. This is a precaution in case a small amount of fuel leaks out while attaching adapters.



END OF BLEED OFF HOSE MUST BE PLACED IN AN APPROVED FUEL CONTAINER

For Ford/Lincoln/Mercury vehicles with test port...

- Remove Test Cap
- Screw Ford test port adapter to fuel rail test port until finger tight.
- Screw GM/Chrysler test port adapter to Ford test port adapter until finger tight.

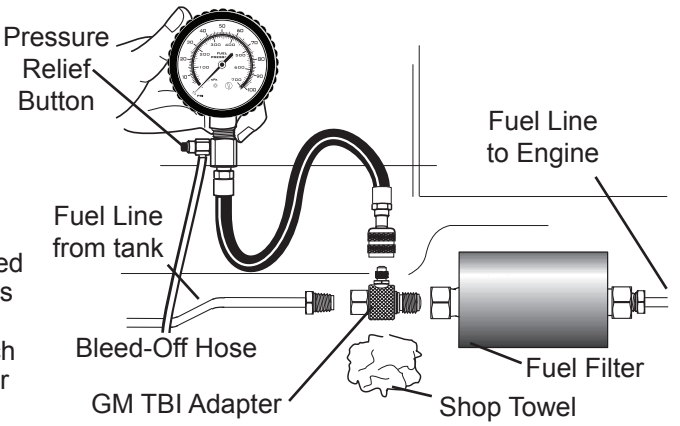


For GM TBI vehicles without a test port ...

- Disable fuel pump(s) and relieve fuel system pressure by following instructions in vehicle service manual.

WARNING:
Some vehicles may have more than one fuel pump. Failure to deactivate all fuel pumps can result in spilled fuel, fire, or other hazardous conditions that could cause vehicle damage personal injury, or death.

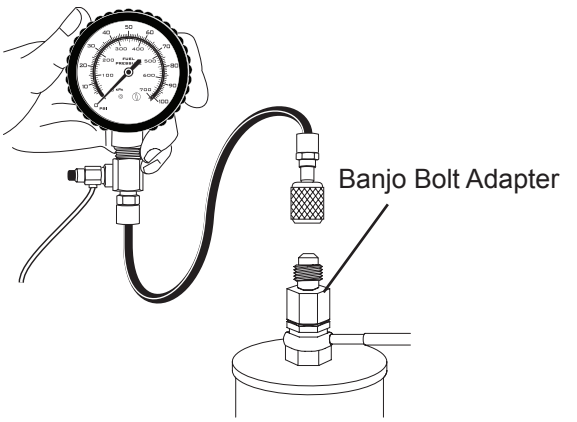
- Disconnect the fuel line at location described in vehicle service manual using shop towels to catch any released fuel.
- Attach GM TBI test adapter, and then attach fuel line to adapter. Tighten all fittings finger tight and then tighten gently 1/2 turn with wrenches.
- Attach hose and pressure gauge assembly to adapter top fitting and tighten fitting until finger tight.



END OF BLEED OFF HOSE MUST BE PLACED IN AN APPROVED FUEL CONTAINER

For import and some domestic vehicles with a banjo bolt connection...

- Relieve fuel system pressure by following instructions in vehicle service manual.
- Remove the vehicle's fuel bolt at location described in service manual. Use shop towels to catch any released fuel.
- Install banjo bolt test adapter in place of fuel bolt. Position banjo bolt gaskets on either side of banjo. Banjo with fuel supply line attached should be sandwiched between banjo bolt gaskets.
- Tighten banjo bolt test adapter finger tight, then gently snug with wrench.
- Connect hose and pressure gauge assembly to banjo bolt test adapter fitting. Tighten gauge hose fitting finger tight.



For import and domestic vehicles with rubber hose connections...

- Relieve fuel system pressure by following instructions in vehicle service manual.
- Disconnect the vehicle's rubber fuel line hose at location described in service manual. Use shop towels to catch any released fuel. Leave rubber hose attached to fuel line.
- Install matching size adapter hose and hose clamps on dual manifold test adapter.
- Connect test adapter hose at location where vehicle's fuel line was disconnected.
- Connect vehicle's fuel line to other side of dual manifold adapter. Use vehicle's hose clamps on rubber hose.
- Tighten all hose clamps securely.
- Connect hose and pressure gauge assembly to dual manifold test fitting. Tighten gauge hose fitting finger tight.

5. Place end of 6 foot bleed-off hose in an approved container for fuel. Bleed-off hose must remain in container until testing is complete.

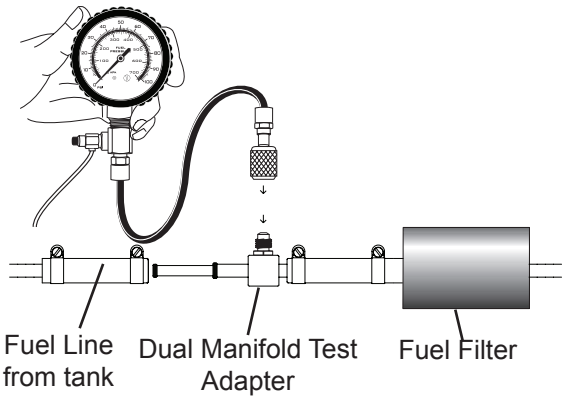
6. Turn all accessories OFF. (Radio, A/C, Blower Fan, Headlights, Windshield Wipers...)

7. Re-activate fuel pump and turn ignition key ON. Do the following checks:

- Listen for fuel pump. Pump should run for approximately 2 seconds.
- Pressurize fuel system by cycling ignition ON and OFF every ten seconds until fuel pressure is at manufacturers specifications (check vehicle service manual for your particular application.)
- Check fuel system for leaks. If leaks are found, turn ignition key OFF and wipe up fuel immediately!
- Read fuel pressure from dial face. Pressure should rise to manufacturer's specification and hold steady.
- If fuel pressure is not within manufacturer's specification, cycle ignition key 2 or 3 more times. If fuel pressure is still not within manufacturer's specifications, service vehicle according to vehicle service manual, then re-test.
- When key-on-engine-off fuel pressure is within manufacturers specification, proceed to Step 8.
- To safely disconnect Fuel Pressure Test Kit, proceed to Step 9.

8. Start engine – Let idle.

- If vehicles fuel system uses a vacuum actuated (compensated) fuel pressure regulator then fuel pressure should drop approximately 3-10 psi, depending on manifold vacuum.



- If vehicles fuel system uses a fuel pressure regulator without a vacuum port then fuel pressure should remain constant during both key-on-engine-off and idle.
- Read fuel pressure from dial face.
- If fuel pressure is not within manufacturer's specification, service vehicle according to vehicle service manual.
- When repair is completed and idle fuel pressure is now within manufacturer's specification, then proceed to Step 9.

9. Turn Ignition Key OFF.

10. Verify that 6 ft. bleed-off hose is still in an approved container for fuel.

11. Fully DEPRESS and HOLD the pressure relief button until dial face pointer is resting on stop pin.

12. Shake bleed-off hose to make sure that all fuel went into approved container.

13. Remove gauge hose.

For GM/Chrysler Vehicles with test port...

- Wrap a shop rag around fuel rail test port in case a small amount of fuel drips out while unscrewing test port adapters.
- Unscrew GM/Chrysler test port adapter from fuel rail test port and reinstall the Test Cap.
- Wrap a shop rag around GM/Chrysler test port adapter so any fuel dripping from gauge hose is absorbed.
- Remove bleed-off hose from approved fuel container and hold gauge hose over container so any remaining fuel will drip into container.

For Ford/Lincoln/Mercury vehicles with test port...

- Wrap a shop rag around fuel rail test port in case a small amount of fuel drips out while unscrewing test port adapters.
- Unscrew GM/Chrysler test port adapter from Ford test port adapter.
- Wrap a shop rag around GM/Chrysler test port adapter so any fuel dripping from gauge hose is absorbed.
- Remove bleed-off hose from approved fuel container and hold gauge hose over container so any remaining fuel will drip into container.
- Unscrew Ford test port adapter from fuel rail test port and reinstall the Test Cap.

For GM TBI vehicles without a test port ...

- Place shop rag under GM TBI adapter in case a small amount of fuel drips out while unscrewing.
- Disconnect Gauge Hose and wrap a shop rag around so any fuel dripping from hose is absorbed.
- Disconnect fuel lines from GM TBI adapter and wrap with shop rag so any fuel dripping from adapter is absorbed.
- Reconnect fuel lines as described in vehicle service manual.

For import and some domestic vehicles with a banjo bolt connection...

- Wrap a shop towel around banjo bolt connection while removing bolt.
- Disconnect hose and pressure gauge assembly from banjo bolt test adapter.
- Wrap a shop towel around end of gauge hose. Hold end of gauge hose over approved container to catch any remaining fuel.
- Loosen banjo bolt test adapter and remove adapter and gaskets.
- Re-install vehicle's fuel bolt with new gaskets on either side of banjo. Install fuel bolt finger tight, then wrench-tighten to specifications given in service manual.
- Check for leaks.

For import and domestic vehicles with rubber hose connections...

- Place a shop towel under dual manifold test adapter.
- Disconnect hose and pressure gauge assembly from dual manifold adapter.
- Wrap a shop towel around end of gauge hose. Hold end of gauge hose over approved container to catch any remaining fuel.
- Loosen hose clamp securing vehicle's rubber fuel line to dual manifold adapter. Disconnect fuel line from adapter.
- Loosen hose clamp securing dual manifold adapter hose to vehicle. Disconnect adapter from vehicle.
- Reconnect vehicle's rubber fuel line to original location.
- Securely tighten hose clamps on vehicle's fuel line.
- Check for leaks.

14. Store shop rags in an approved container so they cannot cause personal injury or a hazardous situation.

15. Store Fuel Pressure Tester in a well ventilated area where it cannot cause personal injury or a hazardous situation.

General Fuel Pressure Diagnostics

Fuel pressure checking is an essential part of fuel injection system troubleshooting. High fuel pressure will make an engine run rich, while low fuel pressure will make an engine run lean or not at all.
Fuel pressure readings that are higher than manufacturer's specifications are generally caused by a problem in the fuel return line components. Conversely, fuel pressure readings that are lower than manufacturer's specifications are generally caused by a problem in the fuel pressure line components.
If fuel pressure readings are not within manufacturer's specifications, then refer to a vehicle service manual for step-by-step diagnostic procedures that will pinpoint the faulty component for a specific vehicle.

Possible causes of high fuel pressure readings are the following:

- Faulty fuel pressure regulator
- Restriction in return line
- Faulty fuel line couplings at fuel tank
- Sticking or "Sluggish" Fuel Injectors

Possible causes of low fuel pressure readings are the following:

- Clogged or restricted fuel filter
- Restriction in pressure line
- Faulty fuel pump
- Faulty fuel pump relay
- Blown fuel pump fuse
- Faulty fuel pump wiring
- Clogged or restricted fuel pump filter
- Faulty fuel pressure regulator
- Leaking fuel injectors
- Faulty fuel line couplings at fuel tank.

Care and Maintenance

Apply a lightweight household oil to the rubber "O" rings inside adapters before each use.